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it will be found at once that

$$\frac{1}{4}[(e^x + e^{-x}) + (e^{ix} + e^{-ix})] = 1 + \frac{x^4}{4!} + \frac{x^8}{8!} + \cdots + \frac{x^{4n}}{(4n)!} + \cdots, \quad (1)$$

$$\frac{1}{4}[(e^x + e^{-x}) - (e^{ix} + e^{-ix})] = \frac{x^2}{2!} + \frac{x^6}{6!} + \frac{x^{10}}{10!} + \cdots + \frac{x^{4n-2}}{(4n-2)!} + \cdots, \quad (2)$$

where $n = 1, 2, 3, \dots$.

Again, since $e^{i\theta} = \cos \theta + i \sin \theta$ it follows that $e^{i(\pi/2)} + e^{-i(\pi/2)} = i - i = 0$.

Consequently by substituting $\pi/2$ for x in formulas (1) and (2) we see at a glance that each of the given series has the same limit $\frac{1}{4}(e^{\pi/2} + e^{-\pi/2})$, that is, the series are "equal."

Also solved by W. W. BEMAN, P. J. DA CUNHA, A. M. HARDING, H. L. OLSON, A. PELLETIER, S. W. REAVES, ELIJAH SWIFT, E. H. WORTHINGTON, and the Proposer.

2785 [1919, 366]. Proposed by W. H. ECHOLS, University of Virginia.

If on the sides, as bases, of any closed plane polygon, there be constructed similar triangles similarly placed, all outward or all inward, then the centroid of the vertices of these triangles coincides with the centroid of the corners of the polygon.

SOLUTION BY THE PROPOSER.

Let $Z_1, \dots, Z_n \equiv Z_1$ be the n corners of the polygon, the Z 's being complex numbers. The sides of the polygon are respectively

$$\Delta Z_r \equiv Z_{r+1} - Z_r, \quad (r = 1, \dots, n-1)$$

and $\Sigma \Delta Z_r = 0$, since the polygon is closed.

The n vertices of the similar triangles constructed similarly on the sides are

$$w_r = Z_r + k \Delta Z_r \cdot e^{i\alpha}, \quad (r = 1, \dots, n-1)$$

k being a real constant factor and α a real constant angle.

Hence,

$$\Sigma w_r = \Sigma Z_r + k e^{i\alpha} \Sigma \Delta Z_r$$

and therefore,

$$\frac{1}{n} \Sigma w_r = \frac{1}{n} \Sigma Z_r.$$

Also solved by S. W. REAVES and ELIJAH SWIFT.

NOTES AND NEWS.

EDITED BY E. J. MOULTON, Northwestern University, Evanston, Ill.

At Ohio State University, Messrs. VAN B. TEACH, V. B. CARIS and D. L. HOLL have been assistants in mathematics for the present year.

H. R. BRAHANA, of Princeton University, has been appointed instructor in mathematics at the University of Illinois for 1920-1921.

Miss MAY J. SPERRY, of Brown University, has been appointed instructor in mathematics and physics, at Knox College, Galesburg, Ill., for 1920-21.

At Brown University Associate Professor H. P. MANNING has resigned after twenty nine consecutive years of service as a teacher in the department of mathematics. Dr. R. F. BORDEN, of the University of Illinois, has been appointed instructor, and Messrs C. D. WENTWORTH and R. L. WILDER graduate assistants, for 1920-21.

At Cornell University, Dr. H. C. M. MORSE, of Harvard University, and Mr. P. A. FRALEIGH, of Dartmouth College, have been appointed instructors in mathematics for 1920-21.

Dr. C. C. CAMP, of the University of Illinois, has been appointed assistant professor of mathematics at Iowa State College.

Dr. CHESTER SNOW has resigned as professor of mathematics at the University of Idaho to accept a position as physicist in the Bureau of Standards, Washington, D. C.

According to *Science*, Professor A. W. BUTTERFIELD, of the department of mathematics at the Worcester Polytechnic Institute, has resigned to become educational director for the Norton Company.

Dr. C. N. REYNOLDS, of Wesleyan University, has been appointed instructor at Dartmouth College for 1920-21.

Dr. O. D. KELLOGG, who has been lecturer in mathematics at Harvard University during the past year, has been promoted to be professor of mathematics.

Miss MARIAN M. TORREY, of Brown University, who has been teaching for two years in the Phebe Anna Thorne Model School of Bryn Mawr College, has been appointed instructor in mathematics at the University of West Virginia.

At the University of Nancy Dr. LÉOPOLD LEAU (1920, 89) has been appointed professor of differential and integral calculus to replace Dr. A. S. E. HUSSON.

At the University of Lyons, Dr. L. SIRE, maître de conférence at the University of Rennes has been appointed professor of applied mathematics in place of the late Professor D. J. B. FLAMME.

At the University of Lille, Dr. A. CHATELET has been appointed professor of general mathematics.

Mr. W. E. H. BERWICK has been appointed lecturer in mathematics in the University of Leeds. *Nature* states:

"Mr. Berwick was assistant lecturer in the University of Bristol for two years, and afterwards became lecturer in mathematics in University College, Bangor. For two years he was engaged on the staff of the anti-aircraft experimental section of the Munitions Inventions Department at Portsmouth, where he made important contributions to the experimental and computative theory of gunnery. He has published a long series of papers in the *Proceedings of the London Mathematical Society* and elsewhere."

Professor G. E. FISHER, of the department of mathematics in the University of Pennsylvania, died March 28, 1920 within about three weeks of his fifty-seventh birthday. He was instructor in mathematics at Cornell University 1887-89, assistant professor at the University of Pennsylvania 1889-1908, and professor since 1908. He was a charter member of the ASSOCIATION.

With Professor I. J. SCHWATT he collaborated in issuing the authorized translation of the fourth German edition of H. Durège's *Elements of the Theory of Functions* (Philadelphia, 1896); *Text-book of Algebra*, part 1 (Philadelphia, 1898); *Rudiments of Algebra*, 1899; *School Algebra*, 1899; and other algebras.

Professor G. D. BIRKHOFF, of Harvard University, has been elected a member of the Royal Danish Academy of Sciences.

Professor L. E. DICKSON, of the University of Chicago, has been elected a member of the American Philosophical Society.

Mr. J. H. JEANS, of Dorking, England, formerly professor of applied mathematics at Princeton University, has been nominated as secretary of the Royal Society of London.

Professor D. R. CURTISS, of Northwestern University, gave an address before the Schoolmasters Club at Ann Arbor, April 3, on "Mathematics."

Professor E. W. BROWN delivered a lecture on the history of mathematics before the Gamma Alpha fraternity of Yale University on February 26. The Astronomical Society of the Pacific has awarded to Professor Brown its Bruce Medal for 1920.

The Silliman lectures at Yale University for 1920 were delivered by Professor JACQUES HADAMARD, of the Collège de France, on April 30, May 3 and May 5. The general subject of the lectures was "Some topics in linear partial differential equations."

At the meeting of the National Research Council on April 28, the Division of Physical Sciences voted to increase its membership by adding a representative of the MATHEMATICAL ASSOCIATION OF AMERICA, and a tenth member-at-large, who should represent mathematics. There were previously in the division fourteen physicists, three representatives of the American Mathematical Society (L. E. DICKSON, O. VEULEN, and H. S. WHITE), three representatives of the American Astronomical Society, one meteorologist and one geodesist.

The fourteenth regular meeting of the American Mathematical Society was held at the University of Chicago, April 9-10. Nineteen papers were presented. At the symposium (1920, 144) Professor MAX MASON discoursed on "The electromagnetic field equations" and Professor A. C. LUNN on "The theory of relativity." There was an attendance of over a hundred at the meeting. At the

dinner on the evening of April 9 Professor L. E. DICKSON reported recommendations of the Committee on Bibliography of which Professor R. C. ARCHIBALD is chairman. On the presentation of a report, including these recommendations, to the Council in New York City on April 23, it was resolved that the Council is of the opinion that a journal of mathematical abstracts is very desirable, and the Committee was authorized to take steps toward securing the financial aid necessary to found such a journal and was requested to present to the Council plans for its organization. The plan for the establishment of a journal of mathematical abstracts was also heartily approved on April 28 by the Division of Physical Sciences of the National Research Council.

At the annual meeting of the National Academy of Sciences in Washington April 26–28 the following papers were read by members of the Association: By A. G. WEBSTER, (a) "The Springfield rifle and the heduc formulæ"; (b) "Some new methods in internal ballistics of the Springfield rifle"; (c) "Preliminary measurements on the pressures in the 'onde de choc'"; (d) "On the connection of the specific heats with the equation of state of a gas"; by L. E. DICKSON, "Recent notable progress in the theory of numbers"; by E. KASNER, "Geodesics and relativity."

Professor M. E. C. JORDAN of the Collège de France was elected a foreign associate of the Academy, and Professor H. F. BLICHFELDT, of Stanford University, the thirteenth member in the Section of Mathematics. The other twelve members are: G. D. BIRKHOFF, G. A. BLISS, O. BOLZA, L. E. DICKSON, E. KASNER, E. H. MOORE, W. F. OSGOOD, W. E. STORY, E. B. VAN VLECK, O. VELEN, H. S. WHITE, and E. T. WILCZYNSKI.

In the American Association for the Advancement of Science what has been prior to 1920, Section A, Mathematics and Astronomy, has been divided into two Sections: Section A, Mathematics, and Section B, Astronomy. The officers of Section A are as follows—Vice-president, D. R. CURTISS; Secretary, W. H. ROEVER; Members of Sectional Committee: 5 years, D. JACKSON; 4 years, A. D. PITCHER; 3 years, G. A. BLISS; 2 years, J. PAGE; 1 year, H. L. RIETZ; Member of the Council, G. A. MILLER; Member of the General Committee, E. V. HUNTINGTON. In Section B the Vice-president is J. STEBBINS, and the Secretary F. R. MOULTON.

At the meeting of the Association of Teachers of Mathematics in New England at Springfield, Mass., March 13, 1920, the following papers by college teachers were presented: by Professor J. W. YOUNG, Dartmouth College, "The work of the National Committee on Mathematical Requirements and the National Council of Teachers of Mathematics"; by Professor ELEANOR C. DOAK, Mount Holyoke College, "Inscriptible polygons"; by Mr. J. S. MIKESH, Yale University, "Courses for teachers of mathematics in secondary schools." At the spring meeting of the Association, at Boston University, May 1, the following papers

were read by members of the Association: By L. R. PERKINS, "College courses for teachers of mathematics"; by C. L. E. MOORE, "Einstein's theory."

At the meeting of Mathematics Teachers of New Jersey in Elizabeth, N. J., April 17, 1920, addresses were delivered by the following members of the ASSOCIATION: By F. DURELL, "The organization of graphic methods" (presidential address); by O. VEULEN, "Displacements and symmetries in three dimensions"; by H. E. WEBB, (a) "Note on the pure quadratic equation," (b) "Note on the proof of Euler's theorem $e^{i\theta} = \cos \theta + i \sin \theta$," and (c) "Certain questions arising from the report of the National Committee."

A new organization, to be known as the National Council of Teachers of Mathematics, was launched at Cleveland, Ohio, on February 24. About 150 persons were present, representing 20 different states and many different organizations of primary and secondary school teachers in various parts of the country. The following officers were elected—President, C. M. Austin, Oak Park, Ill.; vice-president, H. O. Rugg, New York, N. Y.; secretary-treasurer, J. A. Foberg, Chicago, Ill.; executive committee: Marie Gule, Columbus, O. (3 years); J. Rorer, Philadelphia, Pa. (3 years); H. Wheeler, Worcester, Mass. (2 years); W. D. Reeve, Minneapolis, Minn. (1 year). Two members are to be appointed by the committee itself.

Mathematics Teacher, in reorganized form, will probably be the official organ of the Council, administered by an editorial board of from three to five members and an editor in chief. This board is to consist of teachers of elementary and secondary mathematics, and to include a member representing the college group in an advisory capacity.

Sir THOMAS MUIR has recently deeded 2500 books from his mathematical library to the South African Public Library at Cape Town. This collection is mainly made up of serial publications and writings bearing on the theory of determinants, and allied matters. So far as is known the library is in this latter respect the most complete in existence.

Additional announcements (cf. 1920, 192–194) of mathematics courses in Summer Sessions are as follows:

Leland Stanford University, June 22–September 3. By Professor H. F. BLICHFELDT, Columbus, 4 hrs.; Coördinate geometry, 4 hrs.; Advanced course. By H. W. BRINKMAN, Trigonometry, 5 hrs.; Algebra, 4 hrs.

University of Missouri, June 21–August 14. By Professor L. INGOLD, Second calculus and Seminar. By Mr. E. ALLEN, Trigonometry and Analytic geometry.

Ohio State University, June 21–August 13. By Professor H. W. KUHN, Fundamental concepts of algebra and geometry, 4 hrs.; Modern higher algebra, 3 hrs. By Professor S. E. RASOR, Geometrical representation of functions of real and complex variables, 3 hrs.; Integral calculus, 5 hrs. By Assistant Professor HORTENSE RICKARD, Trigonometry, 5 hrs.; Analytic geometry, 5 hrs.

University of Wisconsin, June 28–August 6. By Professor A. DRESDEN, W. W. HART, E. P. LANE, H. W. MARCH, and E. B. SKINNER, and Messrs R. W. BABCOCK, J. E. DAVIS, and H. L. SMITH courses in Algebra; Analytic geometry; Differential calculus; Commerce algebra; Elementary solid geometry; Elementary mathematical analysis; Integral calculus; Teaching of secondary teachers; Differential equations; Theoretical mechanics; Modern analytic geometry; Differential geometry; Special topics in algebra; Elliptic integrals; Axioms of geometry; Point sets; and Differential equations of mathematical physics.

N.B. *University of Chicago*: The first term opens June 21 and not June 1 as stated 1920, 192.

In view of the wide-spread and increasing interest in applied mathematics and the probability that a larger proportion of graduate students may in future be disposed to consider including technical, or semi-technical, subjects in their programs, the departments of Mathematics and Physics at the *Massachusetts Institute of Technology* announce the following list of courses available for graduate students. It will be understood that a particular course may be withdrawn in case a very small number of students should apply for it.

The departments will endeavor to carry out a periodic plan under which, while the more fundamental subjects may be given each year, others will be offered once in two or three years, in rotation. The possible range of subject matter may thus be capable of extension beyond the present list.

In addition to the titles given, there will also be opportunity—as heretofore—for the study of the usual courses in Advanced calculus, Theory of functions, Modern geometry, Modern analysis, etc., also experimental physics.

Analytical mechanics (MOORE). A problem course; three hours per week.

Mathematical laboratory (LIPKA). A treatment of alignment charts and other methods of graphical computation; two hours per week during the second and third terms.

Fourier's series (BAILEY). Two hours per week.

Application of mathematics to chemistry (HITCHCOCK). An application of thermodynamics to chemical problems; three times per week.

Mathematical theory of investment (TAYLOR). Three hours per week for one term.

Advanced mechanics (PHILLIPS). Two hours per week; including Analytical dynamics, Statistical mechanics and Theory of radiation.

Relativity and Einstein's theory of gravitation (PHILLIPS and MOORE). Two hours per week.

Heat conduction (PHILLIPS). Two hours per week for one term.

Aeronautics, 1st course (MOORE). Three hours per week.

Aeronautics, 2d course (WILSON). Two hours per week.

Electrochemistry (H. M. GOODWIN). Four hours per week.

Theoretical physics (WILSON). Three hours per week.

Electromagnetism (WILSON). Including (a) Electrodynamics, (b) Electromagnetic theory, (c)

Applied electromagnetism, of which only one would be offered in a particular year.

Kinetic theory (W. S. FRANKLIN). Two hours per week for two terms.

Constitution of matter (WILSON). Two hours per week.

Research in mathematical physics (WILSON).

Each course will continue through the year (three terms) except where the contrary is stated.